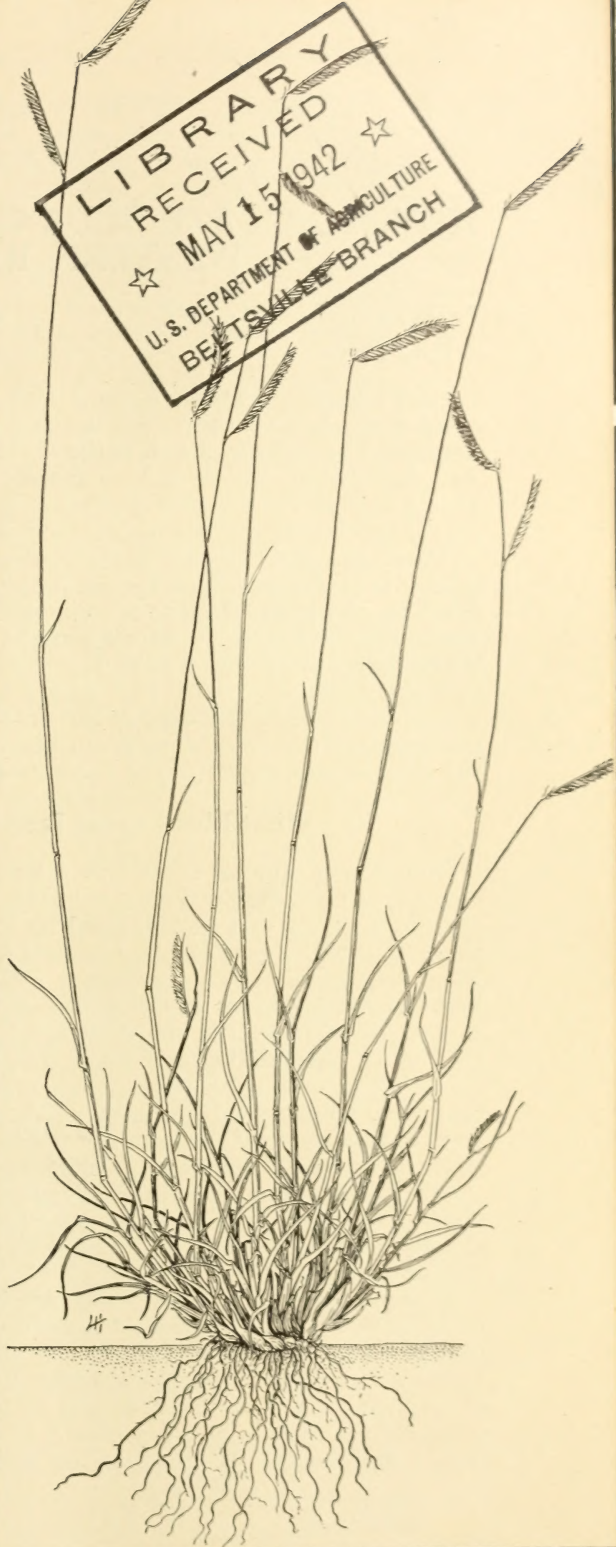


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HOW TO GRAZE BLUE GRAMA

ON
SOUTHWESTERN
RANGES



LEAFLET Nº 215

U. S. DEPARTMENT OF AGRICULTURE

HOW TO GRAZE BLUE GRAMA ON SOUTHWESTERN RANGES

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On 48 million acres in Arizona and New Mexico, or more than a third of the total usable range in these States, as well as on ranges in adjacent Texas, blue grama is the dominant forage plant. Throughout this region, which is here loosely termed the Southwest, blue grama is of primary importance on 13 national forests, on other public lands, and on great areas of private range.

There are three outstanding reasons for this superiority. Blue grama provides excellent forage, is highly resistant to grazing and drought, and is an effective soil binder. To a considerable degree the welfare of the livestock industry in the Southwest is dependent upon maintaining the dominance of blue grama and the further protection and extension of present well-established stands. For these reasons a widespread understanding of the simple principles of utilization and management required to maintain this high-grade forage and to make the most of its soil-protective characteristics is highly desirable.

What Blue Grama Is and How it Grows

Blue grama, like all other true gramas, is characterized by flaglike seed heads extending out from the stalk. (See cover.) The different species of grama can be identified by the number, size, and shape of these "flags." For example, blue and hairy gramas have from one to three, but usually two, per flower stalk. These two gramas, often found growing side by side, can be distinguished by the characteristics of the "blackbone" of the seed head. In hairy grama it extends noticeably beyond the seed head, whereas in blue grama there is no conspicuous prolonged point. When not in flower, blue and hairy gramas are not so easily distinguished; familiarity with the relative degree of hairiness of the leaves of the two species is essential—a detail that can be readily mastered through careful observation.

Black grama, another associated species, can be differentiated by its more slender seed heads and the greater number of them (two to eight, usually four to five) and by its runners and stolons, which are lacking in blue grama.

Blue grama is found from Wisconsin to California and from Alberta to Mexico. In the Southwest it occurs on dry plains, foothills, and plateaus. Its greatest abundance is in the short-grass region of western Texas and eastern New Mexico and in the piñon-juniper woodlands of Arizona and New Mexico, but it also extends upward into the ponderosa-pine zone and downward into the upper edge of the semi-desert grasslands. It is found at elevations of 3,500 feet on the

southwestern plains, at 8,500 feet in the San Francisco Mountains of northern Arizona, and even at 10,000 feet on the Carson National Forest in New Mexico. It will endure temperatures ranging from -40° to $+110^{\circ}$ F. In its region of best growth it is found mainly on loamy soils or the so-called tight lands, but it is also found elsewhere on coarse-textured soils.

At the higher elevations, where temperatures and evaporation are relatively low and precipitation is relatively high, blue grama tends to spread out into a dense, ground-hugging turf with short leaves and flower stalks. At lower elevations, however, where temperatures and evaporation are relatively high and precipitation is relatively low, notably on the Coronado National Forest along the Mexican border in southern Arizona, the stand is usually more open, and the plant has more the appearance of a bunchgrass. It is here, at elevations of about 5,000 feet, that blue grama ordinarily makes its best volume growth.

Blue grama sometimes occurs in almost pure stands, but in the short-grass region is commonly associated with buffalograss, galleta, side-oats, and black and hairy gramas. As this type of range deteriorates, it is replaced by broom snakeweed, the less palatable three-awns, and ring muhly. In the piñon-juniper woodlands the stand may be nearly pure, but more commonly it includes grasses like bluestem wheatgrass, galleta, and wolftail. An indication of deterioration in woodland ranges is the intrusion of broom snakeweed, rabbitbrush, three-awns, ring muhly, and pingüe actinea. Where blue grama occurs within the semidesert grasslands, curly mesquite, and black, hairy, and slender gramas are often found with it. At the higher limits of its distribution, blue grama is a secondary species in stands of mountain muhly, Arizona fescue, pine dropseed, bottlebrush squirreltail, and prairie junegrass.

While blue grama spreads naturally from seed, its most effective method of increase is by tillering, or the lateral spread of established clumps through the development of new shoots at the outside edge. Rapid expansion by this process normally offsets the natural death losses from old age and other causes.

Artificial reseeding of blue grama has been tested extensively on New Mexico ranges. M. M. Hoover, of the Soil Conservation Service, found that 3 to 4 pounds per acre of clean, viable seed planted in rows, or 5 to 8 pounds broadcast, is sufficient to produce a good stand under favorable conditions. For best results the seed should be covered uniformly with soil to a depth of not more than 1 inch nor less than one-half inch. Recent tests by the Bureau of Plant Industry indicate that where soils are light and sandy and tend to blow readily, a preparatory cover crop of close-drilled Sudan grass, sorgo, or other sorghum, mowed so as to leave most of the hay on the land and a protective stubble 8 to 12 inches high, provides a safer and more desirable seed-bed for planting blue grama the following year. In some localities in eastern New Mexico blue grama has been successfully established on abandoned plowed lands by mowing a nearby good stand of blue grama and disking the mixture of seed, chaff, and hay into the soil. With all of these methods the minimum requirements for successful reseeding are: (1) Stabilized soil, (2) viable seed, (3) straw, stalk, hay, or soil mulch covering the seed, and (4) sufficient soil moisture for germination and growth.

Highly Nutritious and Palatable and a Soil Binder

Blue grama is greatly relished by livestock throughout the year. Although under favorable conditions it cures well on the stalk, about half of its nutritive value is lost in curing—and still more when growth is halted by frost rather than by drought. Studies by the New Mexico Agricultural Experiment Station show that blue grama compares favorably with timothy hay in amount of protein, is high in calcium, and has a moderate phosphorus content. Both of these minerals are important in the prevention of such diseases as creeps, bone chewing, and brittle bones. Tests by the Arizona Agricultural Experiment Station reveal that during the summer growing period when the herbage is green and succulent, blue grama is very rich in vitamin A but that it becomes rapidly poorer in this respect with maturity and may be deficient after curing.



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FIGURE 1.—An excellent stand of blue grama on a sheep driveway in the Coconino National Forest, in northern Arizona.

On ranges where it is the dominant plant (fig. 1), blue grama usually constitutes 75 to 90 percent of the feed, and where blue and black gramas occur together it is usually preferred by livestock.

Blue grama withstands trampling well, although it does not equal buffalograss in this respect. It is a 60- to 80-day grass, requiring relatively high temperatures and average moisture for best growth, and ordinarily maturing in late September and early October. It is relatively drought-resistant but fluctuates in density with climatic variations—losing during a single dry year as much as 40 percent. When little or no rain falls during the usual growing season, it remains practically dormant. Slight growth is made from winter moisture; consequently blue grama furnishes little or no green feed during the spring, when succulent forage is especially needed.

Blue grama, if utilized properly, has great soil-protective value and under the best conditions will completely cover the soil surface (fig. 1). The dense fibrous roots, formed mainly in the upper 18-inch soil layer

and mostly near the surface, bind the surface soil very effectively. Only when the stand is markedly reduced by heavy grazing or drought or a combination of both does blue grama fail to give adequate soil protection. When that occurs, however, it is very difficult to check the topsoil movement on the compact clay loams on which blue grama often grows.

Proper Utilization

Where it is dominant, blue grama is a key indicator of range utilization; that is, proper use of blue grama is regarded as indicating proper use of the associated plants and the range as a whole. Where it grows in appreciable volume with some other important forage plant, such as black grama, blue grama is so highly relished that in most instances it is the first plant to reach the limit of proper utilization (fig. 2).

The resistance of blue grama to grazing appears to be approximately the same throughout its range in the Southwest. Ordinarily the



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FIGURE 2.—A short-grass blue and black grama range about properly utilized. Blue grama is the utilization-indicator plant and has been cropped to about 2 inches above the ground, and 25 percent of the flower stalks have been left standing.

stubble height of blue grama after grazing should not be less than 2 inches at the end of the grazing season, and, in addition, 25 or 30 percent of the flower stalks should be left ungrazed. This degree of utilization by autumn on summer ranges and by late spring on either year-long or winter ranges will insure range maintenance and improvement and stability of the soil.

On such a properly grazed blue grama range with average forage growth about 40 percent of the actual volume of blue grama herbage has been removed at the end of the grazing season. To most observers this would appear to represent about 70-percent utilization. However, as is true with most range grasses, a disproportionately large share of the forage of blue grama is in the basal leaf growth close to the ground, as shown in figure 3.

On deteriorated ranges, where blue grama, which should be the climax vegetation, is subordinate to such inferior species as broom

snakeweed, ring muhly, and three-awns, utilization should be judged partly from the remaining blue grama and partly from the present dominant vegetation. On such range the ultimate objective of good management should be to hasten natural revegetation of the blue grama. Grazing use should therefore be more conservative than on good blue grama range. About 40 percent of the blue grama flower stalks should be left standing instead of 25 percent. Where this is accomplished, the stubble of the cropped plants will average about 2½ inches above the ground and some 30 percent of the blue grama forage will have been taken. The light grazing on the less palatable associated plants will not prevent a steady increase in the volume of blue grama in successive seasons.

On deteriorated ponderosa pine ranges, where bunchgrasses such as mountain muhly and Arizona fescue are the natural dominants and

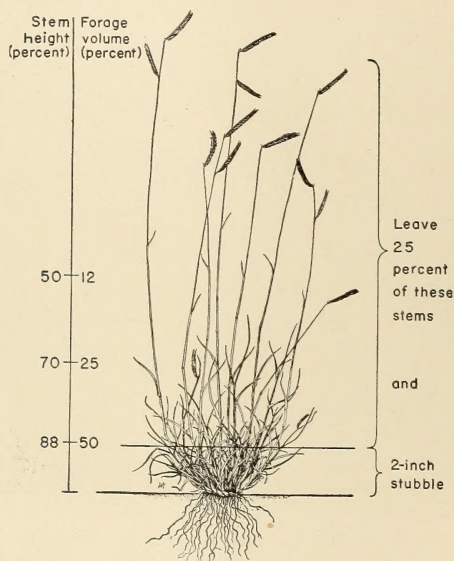


FIGURE 3.—A blue grama plant illustrating proper utilization; 25 percent of the stems should be left and nearly half the forage volume of the cropped stems. Usually the upper half of a blue grama plant contains about 12 percent of the volume, and half the volume is in the lower 12 percent of the height.

blue grama is the invader, utilization should be judged on the basis of the remaining bunchgrasses. If the bunchgrasses are properly utilized, blue grama will usually have been grazed but lightly.

The degree of use at any time prior to the end of the grazing season should be roughly proportional to the period of grazing. If 40 percent of the volume may properly be taken by the end of the season, about 20 percent should have been taken when the season is half over. On yearlong ranges with a 12-month grazing season ending in June approximately one-fourth of the season has passed by the end of the summer-growth period (the end of September) and proper use at this time would take about 10 percent of the volume. Such use is very light and so hard to see that close range inspection is needed to determine it.

Improper Grazing

Blue grama is overutilized on good range when less than 25 percent of the flower stalks and less than 60 percent of the forage volume remain at the end of the season and when the stubble is less than 2 inches high. On range on which during drought years the basal leafage does not make over 2 inches of growth and very few flower stalks are produced, grazing use must be kept to a minimum if soil deterioration, which inevitably accompanies excessive removal of the protective cover of plant material, is to be avoided.

On a greatly overutilized blue grama range there is a sandpapered or slicked-off appearance, the color of the ground surface rather than that of the vegetation is dominant, and surface rocks and debris protrude noticeably above the grazed level of the plants (fig. 4). Other indicators include accelerated wind and water erosion, finger gullies, pedes-



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FIGURE 4.—Overutilized blue grama-bluestem wheatgrass stand in Juniper-piñon woodland type. Note the lack of flower stalks, the visible amount of bare ground, and the prominence of malpais rock on the surface. When properly grazed, the grasses on this area effectively hide all the ground surface and most of the rock, when viewed from a distance.

taled grass tufts, erosion pavement, and an abundance of range plants of low forage value such as broom snakeweed, pingue actinea, three-awns, and ring muhly.

Conservative Management

Blue grama is well suited to grazing by all kinds of domestic livestock, but the relatively flat ranges in the short-grass country afford animals almost no protection against winter storms. Also, despite the high grazing capacity of these grass ranges in average or better years, they are not so dependable in drought years as the more sandy lands with a mixed forage stand. For these reasons most eastern New Mexico ranches prefer some browse for winter feed and protection and some sandy land for a drought reserve to accompany their generally high-grazing-capacity blue grama range.

The grazing capacity of blue grama range lands varies. Under the most favorable climatic and soil conditions in western Texas,

eastern New Mexico, and southeastern Arizona, grazing capacities as high as 35 head of cattle per section yearlong have been reported, although 30 head per section would probably be a safer maximum even here. On the best national-forest ranges 25 cows per section represents about the maximum intensity for sustained grazing capacity, while on average range it is more nearly 15 to 20 cows. On some deteriorated blue grama ranges where broom snakeweed, pingüe actinea, and other low-value plants are increasing, grazing capacity has declined to 5 or 6 head per section for yearlong conservative use.

Conservative stocking, even to the point of seeming understocking, may not be a wasteful practice. Recent studies made by the New Mexico State College of Agricultural and Mechanic Arts show that maximum annual production of livestock in terms of pounds of beef per acre, as well as maximum economic values in terms of net profit per acre, were obtained by stocking below rather than above the usual estimate of grazing capacity. Further, conservative stocking allows the stand to recuperate after drought. As variation between ranges is so great, the actual grazing capacity of local blue grama ranges can be best determined by range surveys followed up by annual utilization checks.

Under present management practices blue grama is grazed during the summer only, the winter only, or throughout the year. This grass does best, however, when it is rested or grazed only lightly during its growing season and then utilized to the proper point during the late fall, winter, or early spring. Maximum growth is obtained under summer deferred grazing, giving opportunity for the seed to mature and disseminate. In addition to proper seasonal use, livestock distribution over the range should be controlled through herding, riding, and proper location of salt and water.

Good management practices similar to those indicated above are the means whereby proper utilization is attained, and utilization guides serve to check on the adequacy of existing management. When management and utilization are satisfactory, ranges in good condition will remain that way, while poor ranges will be built up through natural revegetation.

Common and Botanical Names of Species

Arizona fescue	<i>Festuca arizonica</i>
Black grama	<i>Bouteloua eriopoda</i>
Blue grama	<i>B. gracilis</i>
Bluestem wheatgrass	<i>Agropyron smithii</i>
Bottlebrush squirreltail	<i>Sitanion hystrix</i>
Broom snakeweed	<i>Gutierrezia sarothrae</i>
Buffalograss	<i>Buchloë dactyloides</i>
Curlymesquite	<i>Hilaria belangeri</i>
Galleta	<i>H. jamesii</i>
Hairy grama	<i>Bouteloua hirsuta</i>
Mountain muhly	<i>Muhlenbergia montana</i>
Pine dropseed	<i>Blepharoneuron tricholepis</i>
Pingüe actinea	<i>Actinea richardsoni</i>
Prairie junegrass	<i>Koeleria cristata</i>
Rabbitbrushes	<i>Chrysothamnus</i> spp.
Ring muhly	<i>Muhlenbergia torreyi</i>
Side-oats grama	<i>Bouteloua curtipendula</i>
Slender grama	<i>B. filiformis</i>
Three-awns	<i>Aristida</i> spp.
Wolf tail	<i>Lycurus phleoides</i>

